

AMENDMENTS TO THE CLAIMS

The listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims

1. (Currently Amended) A process for ~~surface activation and/or~~ devulcanization of sulfur-vulcanized rubber particles comprising:

treating one or more sulfur-vulcanized rubber particles ~~biotechnologically with:~~
in a medium with bacteria selected from at least one of a strain of:

(i) Desulfuromonas thiophila; ~~mesophilic anaerobic bacteria;~~

(ii) Desulfuromonas palmitatis; ~~mesophilic optionally anaerobic bacteria;~~

(iii) Sulfurospirillum deleyianum; ~~or mesophilic microaerophilic bacteria;~~

(iv) Desulfuromonas acetoxidans;

~~or~~

~~one or more enzyme systems of a selected bacteria;~~

wherein:

one or more sulfur bridges are broken and an oxidation state of the sulfur is reduced; and

the treatment is carried out at temperatures below 50° Celsius.

~~wherein the treatment of rubber particles is carried out by any one or more of:~~

~~(i) a microbial process; or~~

~~(ii) an enzymatic process, wherein the enzymatic process is carried out by the enzyme system, preferably isolated by the selected bacteria;~~

~~and~~

~~wherein the treatment is carried out at temperatures below 50° Celsius.~~

2. (Currently Amended) The process as recited in claim 1, wherein ~~at least one of: i) the~~ medium for treating the rubber particles comprises water, nutrients, a carbon source, and the selected bacteria; ~~or ii) a concentration of the rubber particles in the medium is maintained below 35 wt %.~~
3. (Currently Amended) The process as recited in claim 1, further comprising intermixing the medium with an agitator to reduce at least one of the temperature and/or concentration gradients.
4. (Currently Amended) The process as recited in claim 1, further comprising carrying out the ~~treatment-treating~~ under one of anaerobic or microaerophilic conditions.
5. (Currently Amended) The process as recited in claim 1, wherein the ~~treatment-treating~~ is carried out at temperatures within ~~an optimal~~ temperature range ~~for mesophilic bacteria~~ of from about 33° C to about 37° C.
6. (Currently Amended) The process as recited in claim 1, wherein the ~~treatment-treating~~ is carried out at a pH value in the region of from about 5 to about 9.
7. (Previously Presented) The process as recited in claim 1, wherein a residence time of the rubber particles in the medium is from about 4 to about 8 days.
8. (Currently Amended) The process as recited in claim 1, wherein the bacteria ~~are capable of sulfur respiration, and~~ belong to ~~one~~ two or more of the *Desulfuromonas thiophila*, *Desulfuromonas palmitatis*, *Sulfurospirillum deleyianum*, or *Desulfuromonas acetoxidans* bacterial strains, ~~or a mixed population thereof.~~

9. (Currently Amended) The process as recited in claim 1, wherein the rubber particles ~~to be treated~~ comprise any one or more of powdered rubber or rubber granulate, wherein the particle size of the powder or granulate is from about 0.1 mm to about 0.6 mm.

10. (Currently Amended) The process as recited in claim 1, wherein the rubber particles ~~to be treated~~ comprise rubber particles made up a composite of sulfur-vulcanized rubber, ~~or composites thereof.~~

11. (Currently Amended) The process as recited in claim 1, wherein the rubber particles ~~to be treated~~ comprise rubber particles made of scrap rubber and/or waste rubber, such that the process recclaims the scrap and/or waste rubber.

12. (Currently Amended) The process as recited in claim 1, wherein the rubber particles ~~to be treated~~ are produced in any one of:

- i) a comminution process, such as a peeling process;
- ii) a hot grinding process;
- iii) a cold grinding process;
- iv) a cryogenic grinding process; or
- v) a wet grinding process;

~~wherein the temperature of the rubber particles remains lower than about 90° C to thereby substantially avoid thermooxidative degradation of the rubber particles.~~

13. (Currently Amended) The process as recited in claim 1, wherein the ~~surface activation and/or devulcanization~~ is substantially restricted to the rubber particle surface and/or layers close to the surface that have a thickness of up to 300 nm, in order to substantially avoid altering the material properties of the main mass of the rubber particle, ~~material.~~

14. (Currently Amended) The process as recited in claim 1, wherein the ~~treatment~~ treating of the rubber particles is carried out in a bioreactor.

15. (Currently Amended) The process as recited in claim 1, ~~claim 16~~, wherein the ~~addition of the rubber particles to be treated into the bioreactor and/or the removal of the rubber particles to be treated from the bioreactor~~treating is carried out in any of a:

- i) continuous fashion;
- ii) quasi-continuous fashion; or
- iii) discontinuous fashion;

~~wherein, when removing the treated rubber particles from the bioreactor, substantially no amount of bacteria and/or medium containing enzymes for treating the rubber particles is discharged therewith or comes into contact with atmospheric oxygen, such as by sedimentation of the rubber particle material and its subsequent removal under anaerobic conditions.~~

16. (Currently Amended) The process as recited in claim 1, wherein: ~~i) any sulfur bridges contained in the rubber particles are at least partially broken by the treatment; and ii) the sulfur is transferred into one or more gas-forming reaction products that during the treating, hydrogen sulfide is produced, and~~ is at least quasi-continuously removed ~~from the gas phase to avoid inhibition and/or toxification of the bacteria; wherein the gas-forming reaction products comprise hydrogen sulfide.~~

17. (Currently Amended) The process as recited in claim 1, further comprising:

after treating, washing the ~~treated~~ rubber particles with water ~~after treatment to~~ reduce salt loading; and

subsequently drying the washed, ~~treated~~ rubber particles at temperatures below 90° C.

18. (Cancelled)

19. (Cancelled)

20. (New) The process as recited in claim 1, wherein at least one of a concentration of the rubber particles in the medium is maintained below 35 wt-%.